

## Appendix C

### Summaries of Analyte Concentrations

#### TNC sites co-located with PLP

Region	TNC site name	PLP site name
North Fork Koktuli	NK-01	NK100A
	NK-21	NK119B
South Fork Koktuli	SK-01	SK100B
	SK-12	SK124A
Upper Talarik	UT-01	UT100E
	UT-02	UT100B
Kaskanak Creek	KC-01	KC100A

#### Unique TNC sites

Region	TNC site name
North of mining claims, draining into Lake Clark	CH-11
	NW-11
	GH-01
	RC-01
North Fork Koktuli	NK-02
	NK-11
	NK-31
South Fork Koktuli	SK-02
	SK-11
	SK-21
	SK-31
	SK-41
	SK-51
Upper and Lower Talarik	UT-11
	UT-12
	UT-21
	UT-31
	UT-41
	LT-11
Kaskanak and Stuyahok Rivers	KC-11
	SY-01
	SY-02
	SY-11

For the following charts, the minimum and maximum concentrations include all field replicates

Summary of range and means for trace metals and radioactive elements in very low concentrations.

Analytes in low concentration				
Analyte	Relevant Standard	units	Minimum	Maximum
gross alpha	15	pCi/L	< 1.5	1.8
gross beta	4 millirems	pCi/L	<1.5	3.3
Antimony	6	ug/L	<0.01	0.1
Arsenic	10	ug/L	< 0.10	3.9
Chromium	100	ug/L	0.09	1.09
Cyanide	5.2	ug/L	< 0.01	< 0.01
Mercury	50	ng/L	0.4	5.4
Molybdenum	10	ug/L	<0.02	3.2
Nickel	10.5	ug/L	0.05	0.94
Selenium	5	ug/L	<0.3	0.3
Uranium	30	ug/L	<0.003	0.12

**Summary of range and means for trace metals in higher concentrations.** To calculate median, the mean of each set of field replicates was calculated and median derived from the mean of each set of replicates. Concentrations listed in the "sites" column refer to the mean concentration of a set of replicates and may be lower than the highest measured concentration of a single field replicate within a set.

Analytes in higher concentrations						
Analyte	Sample dates	Relevant Standard (ug/L)	Minimum	Maximum	Median of replicate means	Sites with concentrations greater than standard (ug/L)
Cadmium, total	all	0.07	<0.005	0.091	0.010	SK-11 May (0.08), SK-12 June (0.09)
Cadmium, dissolved	all	0.07	<0.005	0.046	0.007	none
Copper, total	May 2009	1.8	0.11	2.70	0.29	SK-11 (2.6)
	June 2009, June 2010		0.04	5.6	0.20	SK-12 2009 (5.6) SK-12 2010 (2.2) SK-31 2009 (5.3) SK-31 2010 (4.4)
Copper, dissolved	May 2009	1.77	0.07	0.82	0.19	none
	June 2009, June 2010		0.05	3.57	0.19	SK-12 (1.89), SK-31 (3.57)
Lead, total	May 2009	0.28	0.03	0.85	0.16	NW-11 (0.34), SK-11 (0.54), UT-02 (0.29), KC-01 (0.43), CH-11 (0.6)
	June 2009, June 2010		0.01	0.90	0.03	SK-12 2009 (0.9)
Lead, dissolved	all	0.30	0.01	0.08	0.01	none
Zinc, total	all	24	0.3	15.3	1.5	none
Zinc, dissolved	all	24	0.3	10.5	1.6	none

**Summary of range and means of minor element metals.** To calculate median, the mean of each set of field replicates was calculated and median derived from the mean of each set of replicates. Concentrations listed in the "sites" column refer to the mean concentration of a set of replicates and may be lower than the highest measured concentration of a single field replicate within a set.

Analytes in higher concentrations						
Analyte	Sample dates	Relevant Standard (ug/L)	Minimum	Maximum	Median of replicate means	Sites with concentrations greater than standard (ug/L)
Aluminum, total	May 2009	87	31	1070	105	NW-11 (299), CH-11 (1028), SK-11 (452), NK-01 (140), UT-01 (105), UT-02 (330), UT-11 (92), KC-01 (972), SY-11 (141)
	June 2009, June 2010		9	218	43	CH-11 2010 (147) SK-12 2009 (197) KC-01 2009 (102) KC-11 2009 (218) SY-02 2010 (136) SY-11 2009 (121)
Aluminum, dissolved	May 2009	87	9	79	28	none
	June 2009, June 2010		3	120	12	SY-11 2009 (119)
Iron, total	May 2009	1000	36	1580	253	KC-01 (1070) CH-11 (1510)
	June 2009, June 2010		16	601	178	none
Iron, dissolved	May 2009	1000	16	222	85	none
	June 2009, June 2010		6	317	62	none
Manganese, total	May 2009	50	8	104	30	CH-11 (103), SK-11 (51)
	June 2009, June 2010		1	61	12	CH-11 2010 (61)
Manganese, dissolved	May 2009	50	6	70	16	CH-11 2010 (67)
	June 2009, June 2010		0.4	51	7	CH-11 2010 (51)

**Major Elements.** Cations are rounded to the nearest 1 mg/L except potassium to the nearest 0.1 mg/L. Bicarbonate was calculated from alkalinity and pH for 2009 and calculated by the lab in 2010. Alkalinity at some sites varied substantially between May and June.

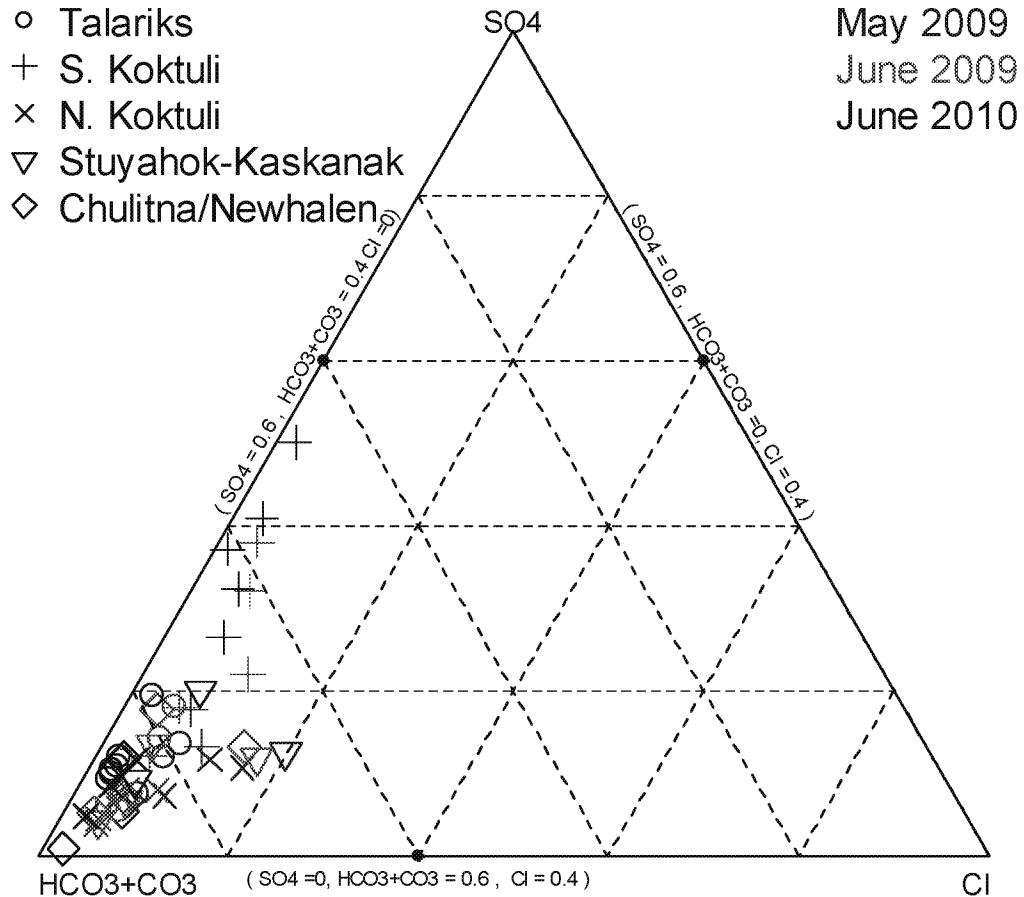
Watershed	Site	Ca	Na	Mg	K	SO <sub>4</sub>	Cl	HCO <sub>3</sub>	Alkalinity, May 2009	Alkalinity, June 2009	Alkalinity June 2010
North of Mine Lease	CH-11	5-6	2	2	0.3-0.7	1	1	27-34	22	25	34
	NW-11	5-9	2	1	0.2-0.5	2	1	26-32	21	23	32
	GH-01	2.5	1	1	0.3	1	1	5		4	
	RC-01	7	1.5	1	0.3	5	1	29		24	
Talariks	LT-11	3-5	1.5	1	0.2-0.3	2-3	1	17-24	14	20	
	UT-01	4-11	2-4	1-3	0.4-0.6	3-8	1	14-39	20	31	39
	UT-02	4-8	2	1-2	0.3-0.5	2-3	1	22-34	18	22	34
	UT-03	8	3	2	0.4	3	1	33			33
	UT-11	4-7	2	1	0.2-0.5	2	1	24-26	20	21	26
	UT-12	7	2	1	0.2	3	1	31			31
	UT-21	5	2	1	0.2	1	1	24		20	
	UT-31	6	2	1	0.1	5	1	26		21	
	UT-41	14	2	2	0.2	5	1	47			47
North Fork Koktuli	NK-01	2-4	1-2	1	0.2-0.5	2	1	12-22	10	18	18
	NK-02	4	2	1	0.2	2	1	22			22
	NK-11	4-8	2-3	1-2	0.4-0.9	1	1	15-40	12	28	40
	NK-21	2	1	0.5	0.1-0.3	1	1	10-13	9	11	
	NK-31	5	3	2	0.7	1	1	30		25	
South Fork Koktuli	SK-01	4	2	1	0.2-0.3	4	1	20-26	16	17	
	SK-02	4	2	1	0.2	5	1	14			14
	SK-11	4	1	1	0.4	4	1	14	11		
	SK-12	5-6	1	1	0.2-0.3	9	1	13-18		11	20
	SK-21	2-5	1-2	0.5-1	0.3-0.4	2-3	1	12-24	9	20	
	SK-31	5-8	2-4	1	0.5-0.7	10-20	1	20-42		16	42
	SK-41	4	1	1	0.2	4	1	14			14
	SK-51	9	4	2	0.6	20	1	24			24
Kaskanak	KC-01	2-5	1-2	0.5-1	0.4-0.6	1	1	7-27	5	22	25
	KC-11	3	2	0.5	0.3	1	1	26		22	
Stuyahok	SY-01	3	2	0.5	0.2	4	1	27		22	
	SY-02	0.5	2	1	0.2	4	1	15			15
	SY-11	0.5	0.5	0.5	0.1-0.3	1	1	<1 - 8	0.5	4	
Range		0.5-14	0.5-4	0.5-3	0.1-0.9	1-20	1	<1 - 47	0.5-22	4-31	14-49
Median of monthly means		4.9	1.9	1	0.3	2	1	21	12	21	29

**Cation-Anion balances.** Many of the samples with RPD greater than 10% had anions in concentrations less than 5MRL. Cations (calcium, magnesium, sodium) were in concentration greater than 5MRL except at site SY-11. Potassium was less than 5MRL for all sites.

Sample Name	Cation Sum (meq/L)	Anion Sum (meq/L)	RPD	Date	Alkalinity < 5MRL	Sulfate < 5MRL	Cl < 5MRL	Notes
CH-11-01	0.45	0.47	2%	May 2009				
CH-11-02	0.44	0.49	5%	May 2009				
CH-11-01	0.56	0.54	2%	June 2009			X	
CH-11-02	0.55	0.52	3%	June 2009			X	
CH-11-01	0.72	0.72	0%	June 2010	x		X	
GH-01-01	0.26	0.11	<b>41%</b>	June 2009	x	X	X	
KC-01-01	0.13	0.17	<b>13%</b>	May 2009	x	X		
KC-01-02	0.16	0.13	10%	May 2009				
KC-01-01	0.4	0.47	8%	June 2009				
KC-01-02	0.4	0.5	<b>11%</b>	June 2009				
KC-01-01	0.46	0.56	10%	June 2010	x		X	
KC-11-01	0.27	0.45	<b>25%</b>	June 2009		X	X	
LT-11-01	0.29	0.35	9%	May 2009				
LT-11-02	0.3	0.33	5%	May 2009				
LT-11-01	0.4	0.49	10%	June 2009			X	
NK-01-01	0.24	0.24	0%	May 2009	x			
NK-01-02	0.23	0.26	6%	May 2009				
NK-01-01	0.36	0.41	6%	June 2009			X	
NK-01-01	0.38	0.41	4%	June 2010			X	
NK-01-02	0.39	0.42	4%	June 2010			X	
NK-02-01	0.38	0.49	<b>13%</b>	June 2010			X	
NK-11-01	0.36	0.27	<b>14%</b>	May 2009				
NK-11-02	0.36	0.3	9%	May 2009				
NK-11-01	0.58	0.6	2%	June 2009			X	
NK-11-01	0.73	0.83	6%	June 2010			X	
NK-21-01	0.24	0.28	8%	May 2009				
NK-21-02	0.24	0.18	<b>14%</b>	May 2009	x			
NK-21-01	0.2	0.26	<b>13%</b>	June 2009			X	
NK-31-01	0.57	0.54	3%	June 2009			X	
NW-11-01	0.41	0.47	7%	May 2009				
NW-11-02	0.42	0.45	3%	May 2009				
NW-11-01	0.58	0.52	5%	June 2009			X	
NW-11-01	0.66	0.73	5%	June 2010			X	
RC-01-01	0.49	0.6	10%	June 2009			X	
SK-01-01	0.37	0.42	6%	May 2009				
SK-01-02	0.37	0.42	6%	May 2009				
SK-01-01	0.32	0.52	<b>24%</b>	June 2009			X	
SK-01-02	0.33	0.34	1%	June 2009			X	

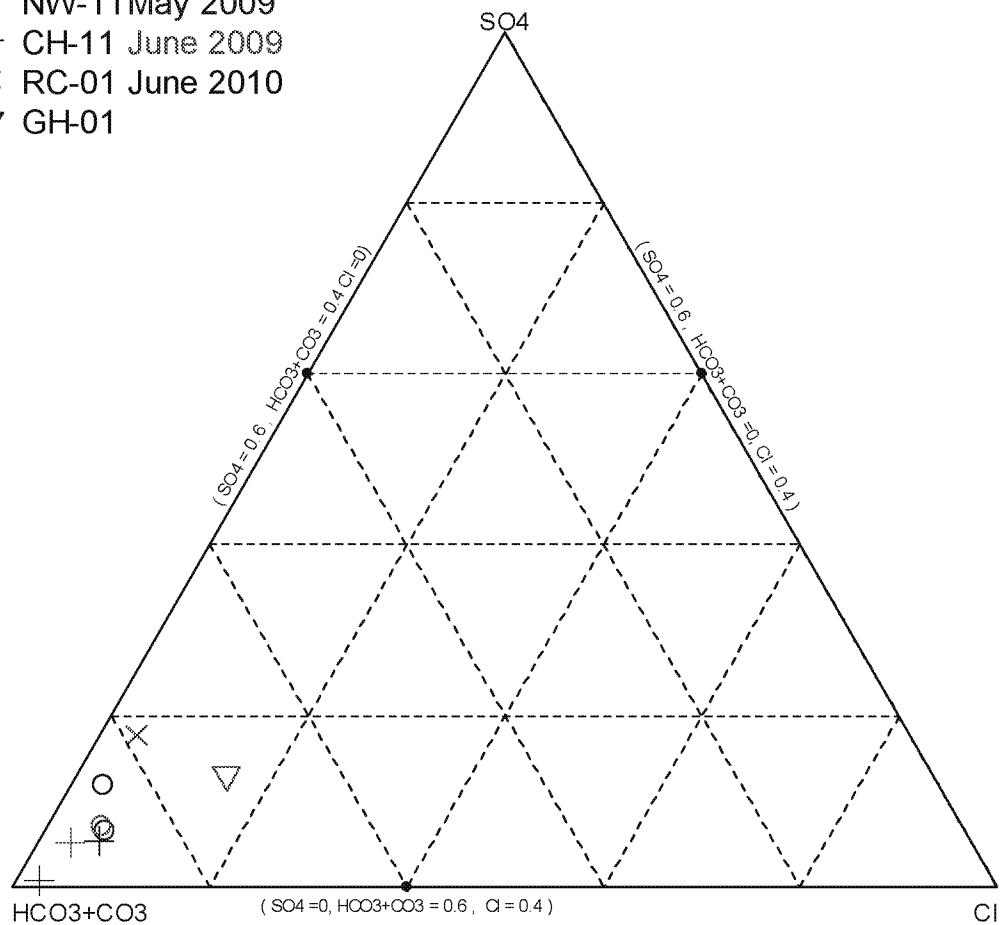
Sample Name	Cation Sum (meq/L)	Anion Sum (meq/L)	RPD	Date collected	Alkalinity < 5MRL	Sulfate < 5MRL	Cl < 5MRL	Notes
SK-02-01	0.34	0.4	8%	June 2010			X	
SK-11-01	0.31	0.33	3%	May 2009				
SK-11-02	0.31	0.33	3%	May 2009				
SK-12-01	0.34	0.35	1%	June 2009			X	
SK-12-01	0.43	0.62	18%	June 2010			X	
SK-12-02	0.44	0.55	11%	June 2010			X	
SK-21-01	0.18	0.27	20%	May 2009				
SK-21-02	0.18	0.19	3%	May 2009	X			
SK-21-01	0.43	0.48	5%	June 2009			X	
SK-31-01	0.48	0.55	7%	June 2009			X	
SK-31-01	0.74	1.25	26%	June 2010			X	
SK-41-01	0.33	0.38	7%	June 2010			X	
SK-51-01	0.81	0.9	5%	June 2010			X	
SY-01-01	0.39	0.53	15%	June 2009			X	
SY-02-01	0.35	0.4	7%	June 2010			X	
SY-11-01	0.07	0.05	17%	May 2009	X	X		Na
SY-11-02	0.07	0.05	17%	May 2009	X	X		Na, Ca, Mg
SY-11-01	0.06	0.09	20%	June 2009	X	X	X	Na, Ca, Mg
SY-11-02	0.06	0.07	8%	June 2009	X	X	X	Na
UT-01-01	0.43	0.56	13%	May 2009				
UT-01-02	0.43	0.39	5%	May 2009				
UT-01-01	0.76	0.72	3%	June 2009			X	
UT-01-01	0.94	0.95	1%	June 2010			X	
UT-02-01	0.38	0.41	4%	May 2009				
UT-02-02	0.38	0.41	4%	May 2009				
UT-02-01	0.49	0.49	0%	June 2009			X	
UT-02-01	0.68	0.75	5%	June 2010			X	
UT-03-01	0.66	0.72	4%	June 2010			X	
UT-03-02	0.67	0.72	4%	June 2010			X	
UT-11-02	0.4	0.46	7%	May 2009				
UT-11-01	0.42	0.46	5%	May 2009				
UT-11-01	0.35	0.46	14%	June 2009			X	
UT-11-01	0.55	0.58	3%	June 2010			X	
UT-12-01	0.56	0.69	10%	June 2010			X	
UT-21-01	0.42	0.44	2%	June 2009			X	
UT-31-01	0.44	0.54	10%	June 2009			X	
UT-41-01	0.95	1.1	7%	June 2010			X	
UT-41-02	0.95	1	3%	June 2010			X	

### All Watersheds, Site Means, Anions



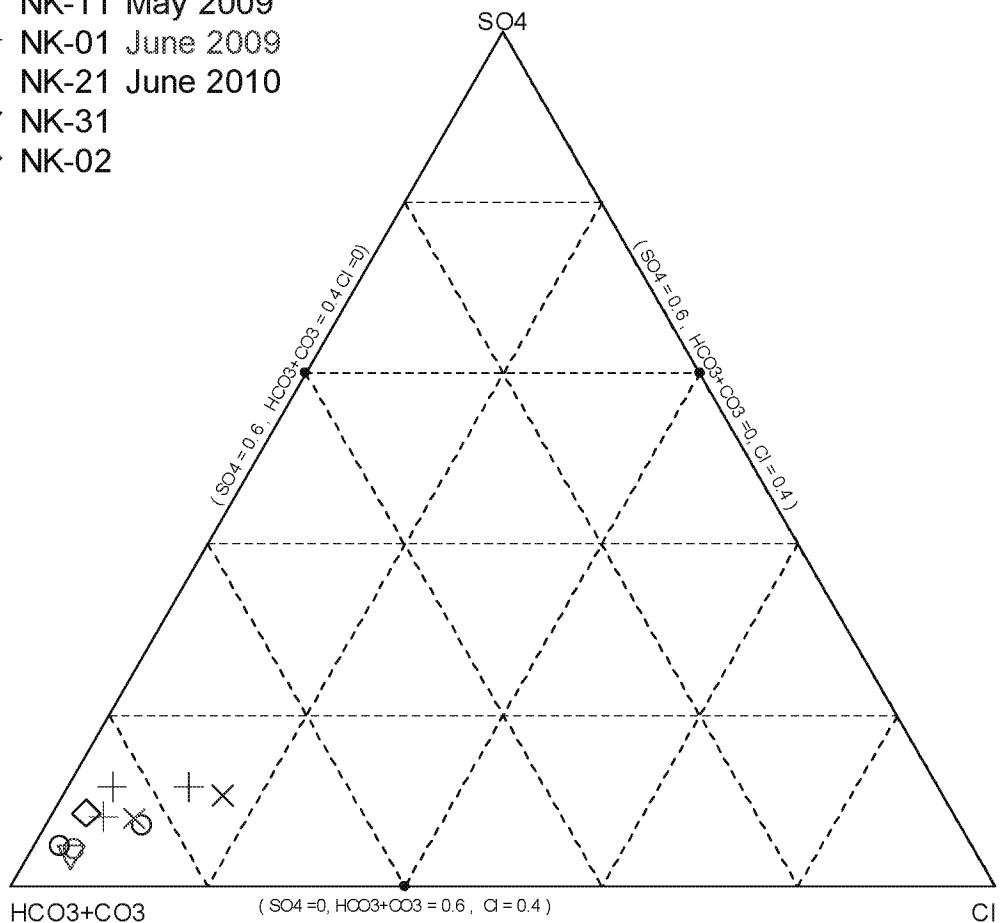
### Chulitna/Newhalen Site Means, Anions

- NW-11 May 2009
- + CH-11 June 2009
- × RC-01 June 2010
- ▽ GH-01



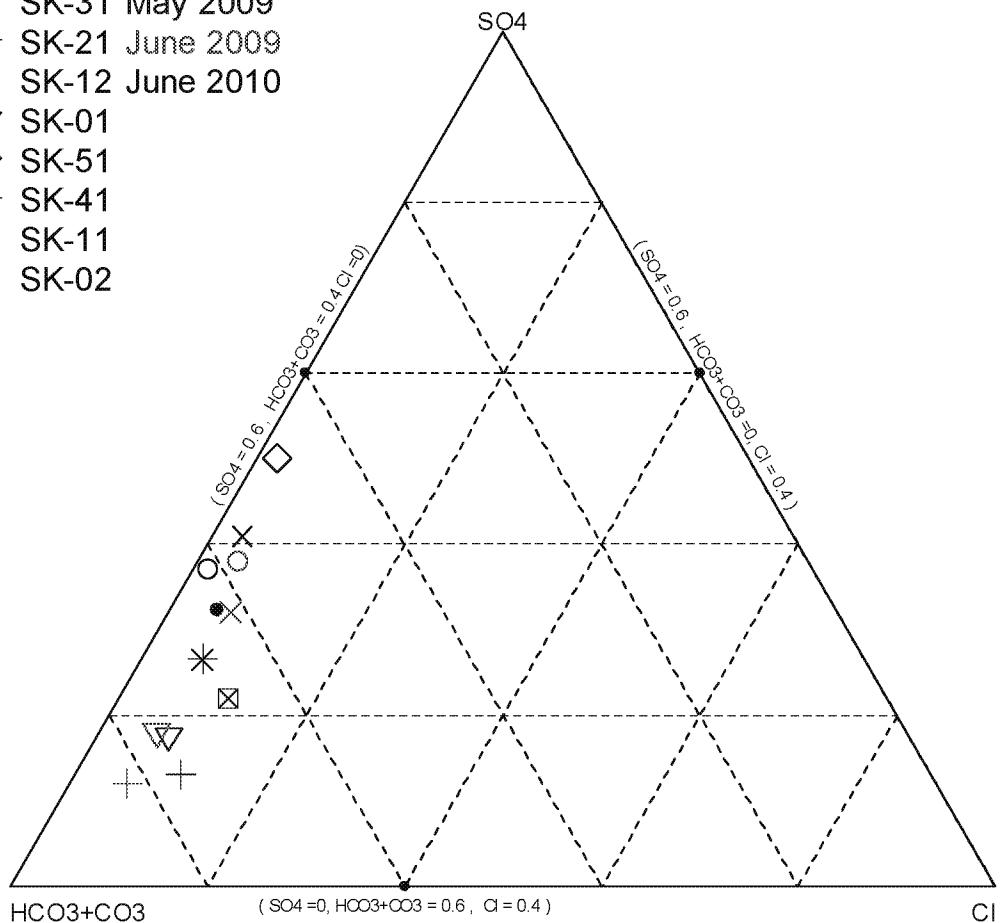
### N. Koktuli Site Means, Anions

- NK-11 May 2009
- + NK-01 June 2009
- × NK-21 June 2010
- ▽ NK-31
- ◇ NK-02



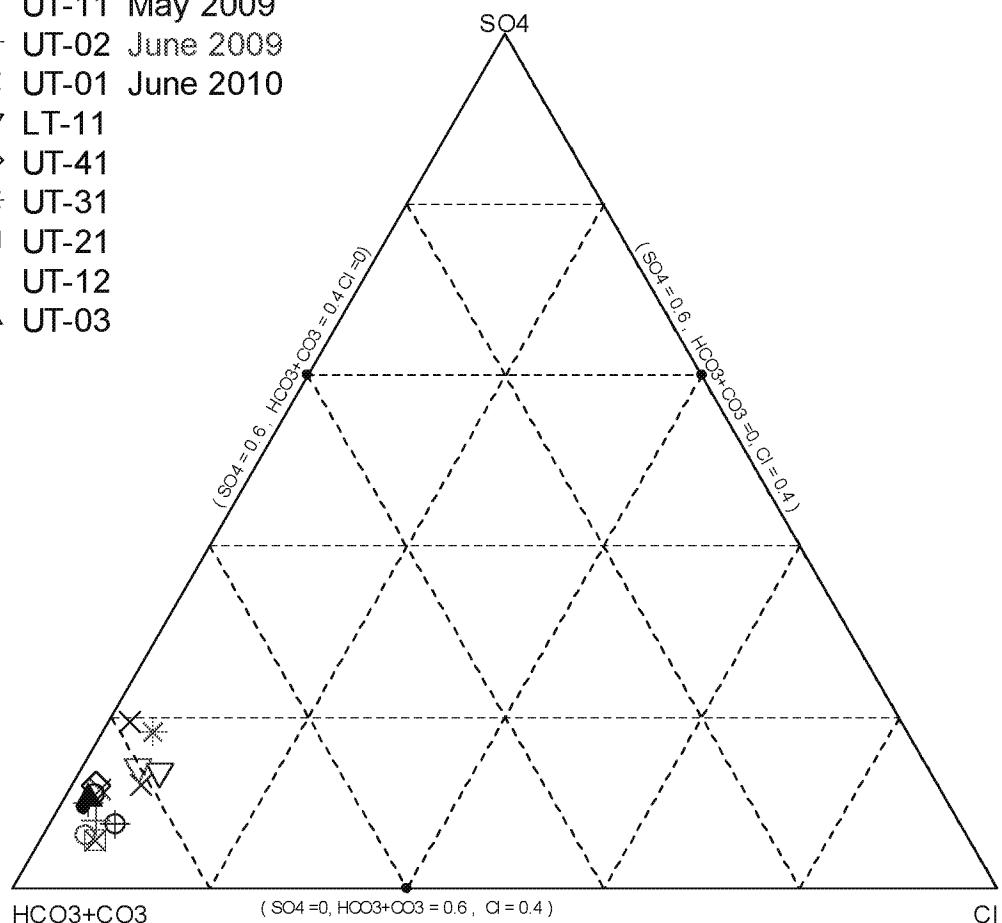
### S. Koktuli Site Means, Anions

- SK-31 May 2009
- + SK-21 June 2009
- × SK-12 June 2010
- ▽ SK-01
- ◇ SK-51
- \* SK-41
- ◻ SK-11
- SK-02



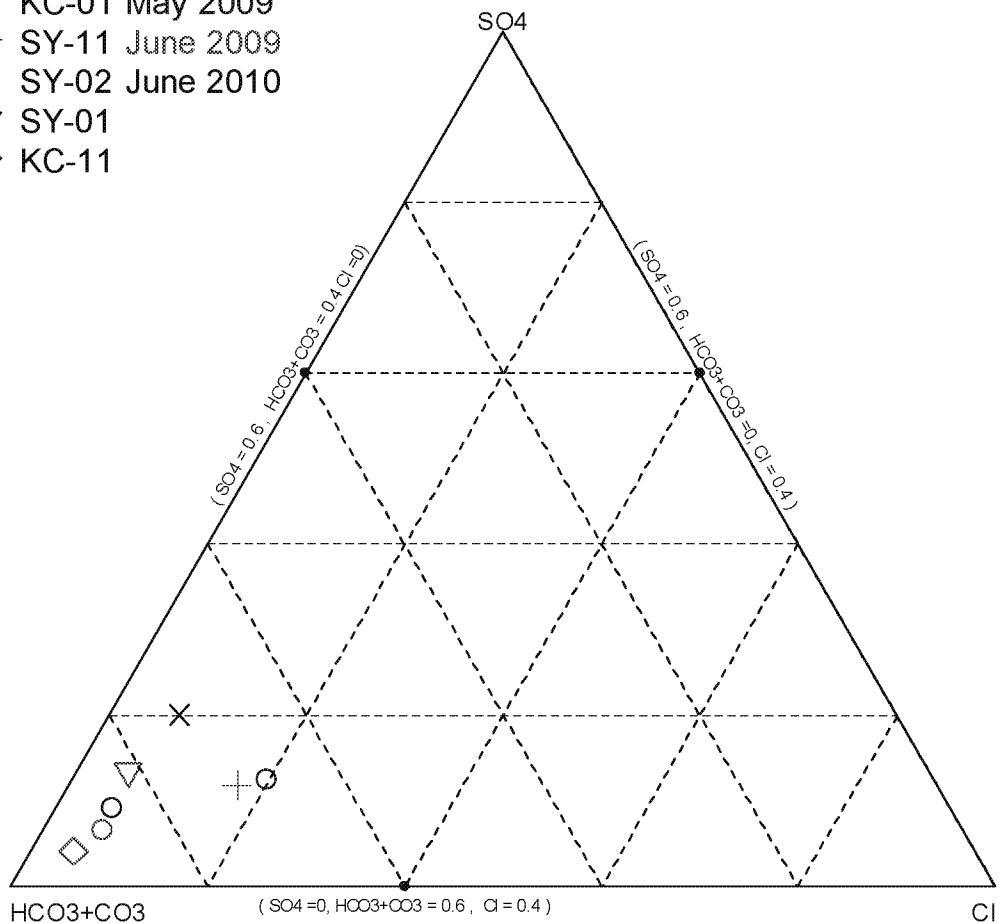
### Talariks Site Means, Anions

- UT-11 May 2009
- + UT-02 June 2009
- × UT-01 June 2010
- ▽ LT-11
- ◇ UT-41
- \* UT-31
- ☒ UT-21
- UT-12
- ▲ UT-03

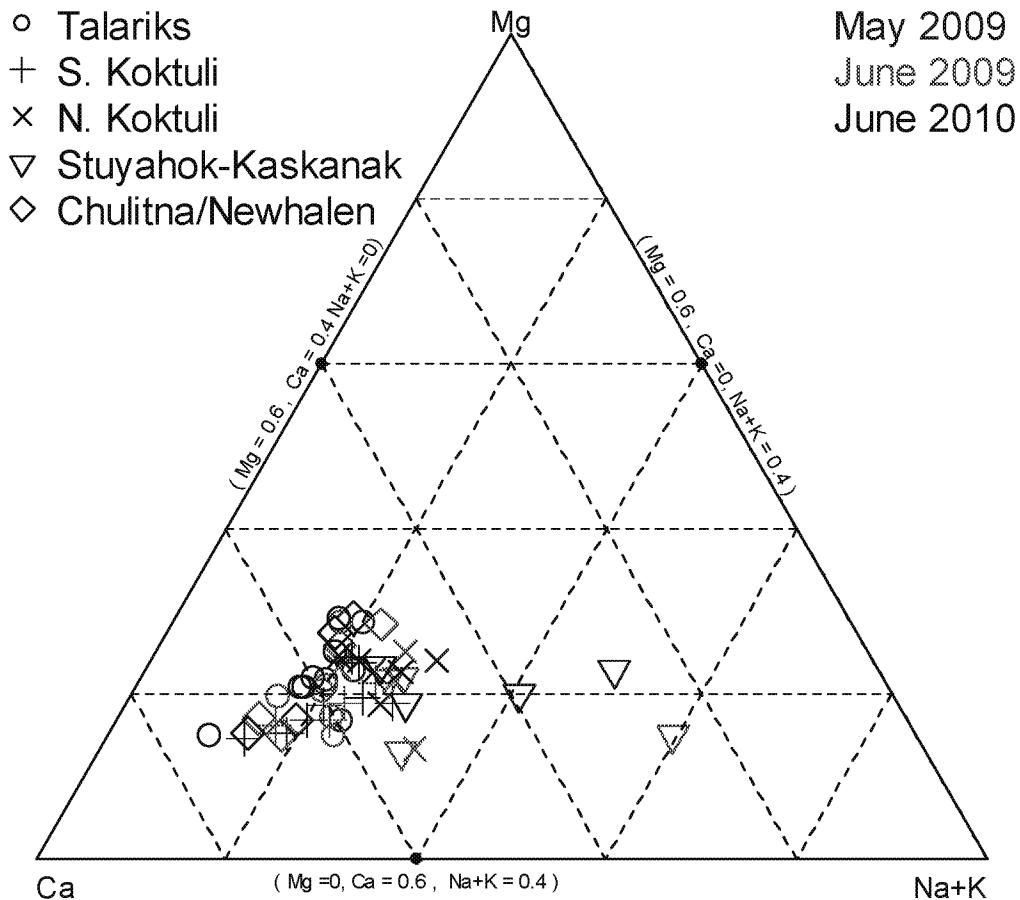


### Stuyahok-Kaskanak Site Means, Anions

- KC-01 May 2009
- + SY-11 June 2009
- × SY-02 June 2010
- ▽ SY-01
- ◇ KC-11

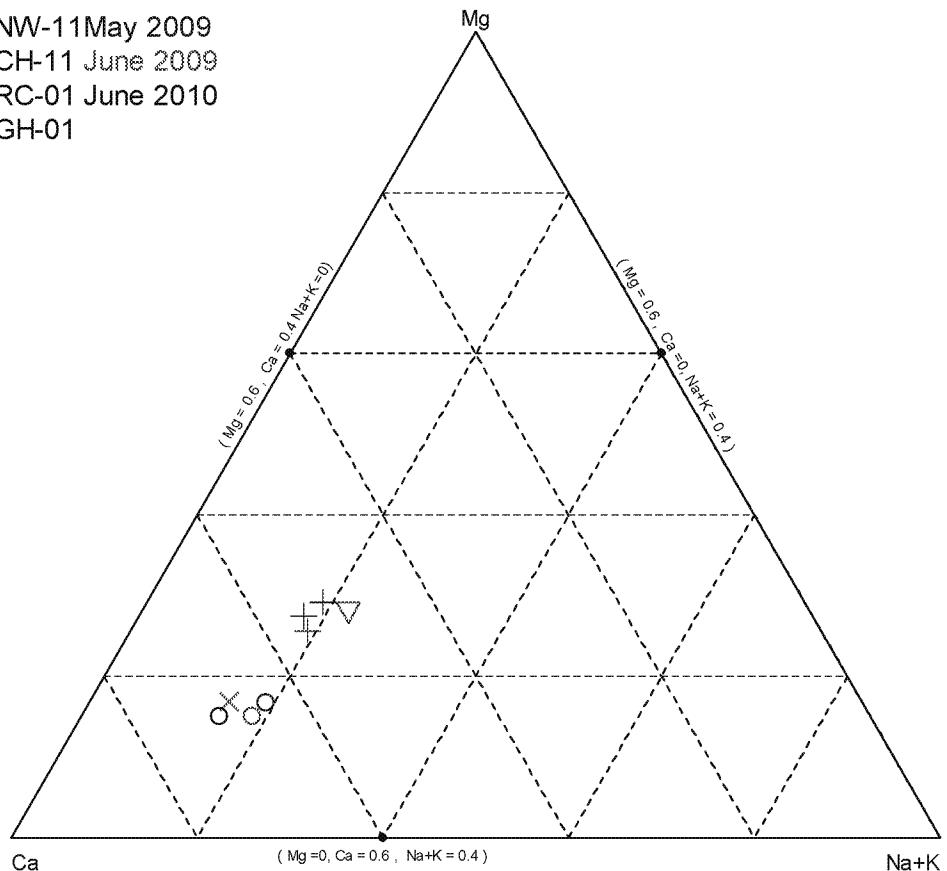


### All Watersheds, Site Means, Cations



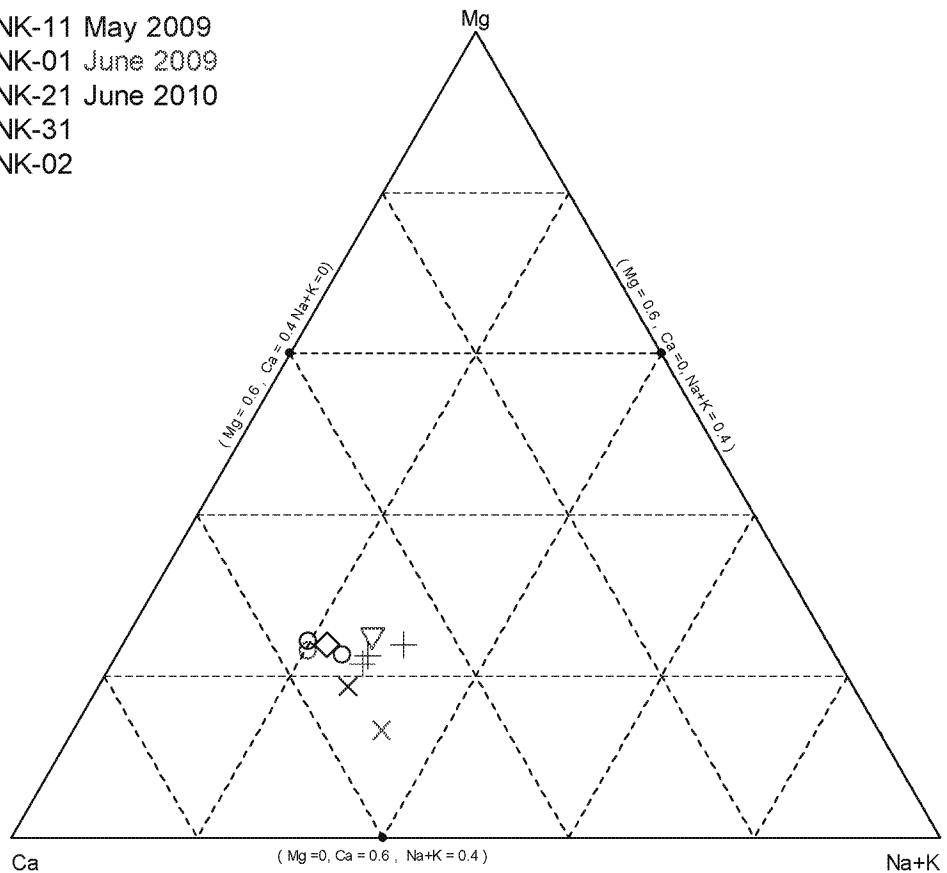
### Chulitna/Newhalen Site Means, Cations

- NW-11 May 2009
- + CH-11 June 2009
- × RC-01 June 2010
- ▽ GH-01



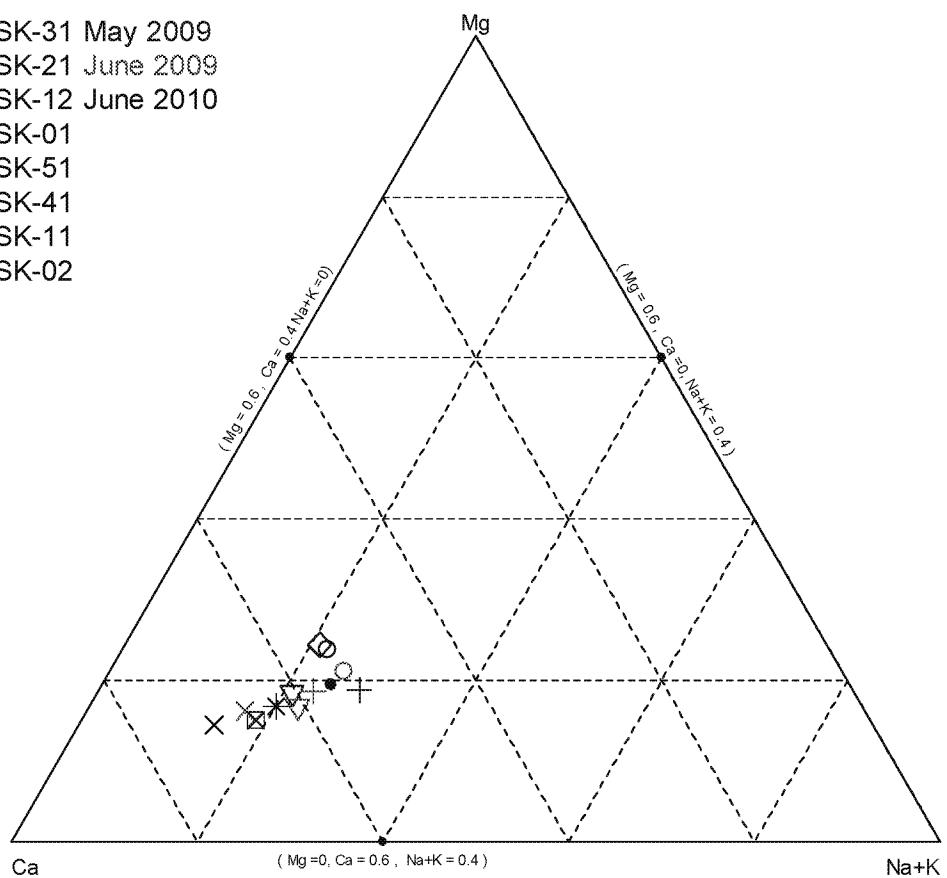
### N. Koktuli Site Means, Cations

- NK-11 May 2009
- + NK-01 June 2009
- × NK-21 June 2010
- ▽ NK-31
- ◇ NK-02



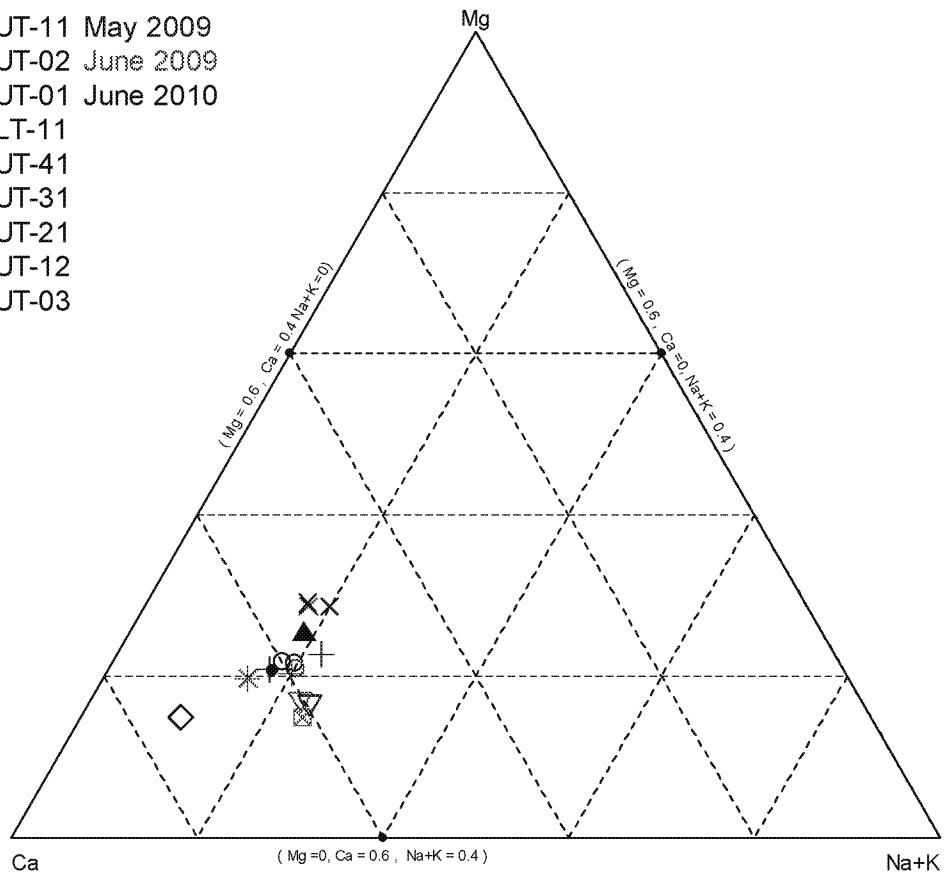
### S. Koktuli Site Means, Cations

- SK-31 May 2009
- + SK-21 June 2009
- × SK-12 June 2010
- ▽ SK-01
- ◇ SK-51
- \* SK-41
- ◻ SK-11
- SK-02



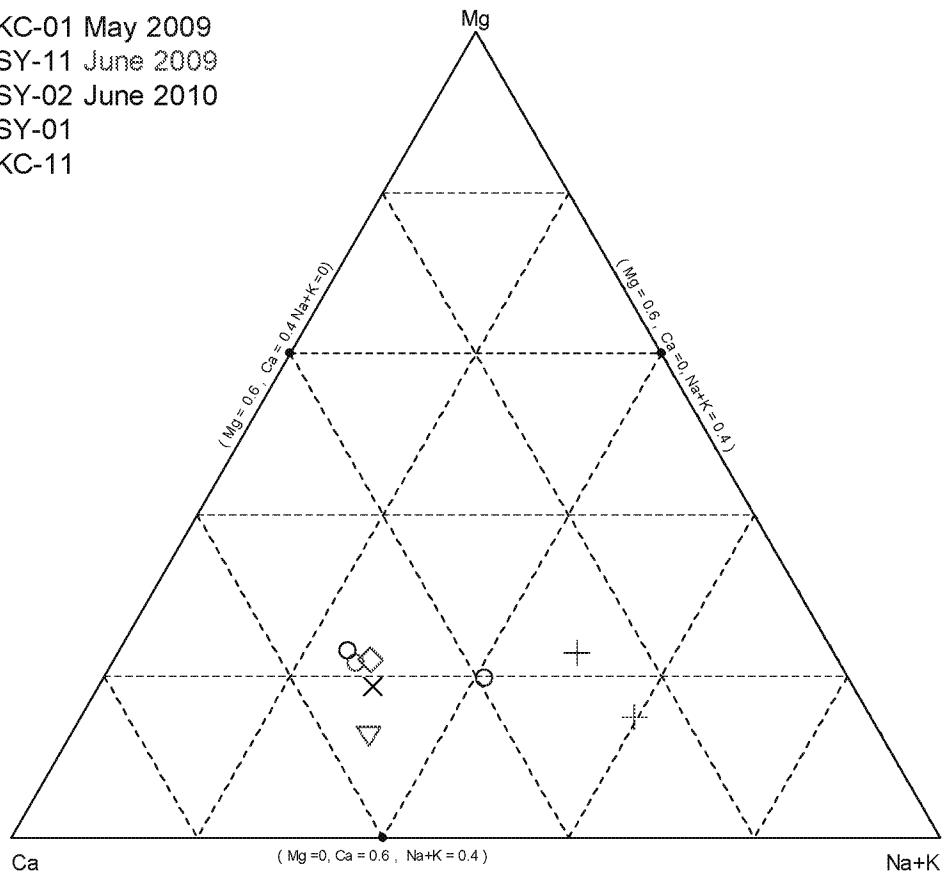
### Talariks Site Means, Cations

- UT-11 May 2009
- + UT-02 June 2009
- × UT-01 June 2010
- ▽ LT-11
- ◇ UT-41
- \* UT-31
- ▣ UT-21
- UT-12
- ▲ UT-03



### Stuyahok-Kaskanak Site Means, Cations

- KC-01 May 2009
- + SY-11 June 2009
- × SY-02 June 2010
- ▽ SY-01
- ◇ KC-11



**Concentrations of metals.** The most relevant metals are listed by site and date. Concentrations are listed as the mean when field replicates were analyzed.

Watershed	Site	Date	Aluminum (ug/L)		Iron (ug/L)		Manganese (ug/L)		Difference in total aluminum May v June 2009	
			Total	Dissolved	Total	Dissolved	Total	Dissolved	absolute (ug/L)	%
South Fork Koktuli	SK-01	5/1/09	34	9	88	28	8	7	10	29%
		6/6/09	43	13	137	31	7	4		
	SK-02	6/8/10	31	11	278	125	15	8		
	SK-11	5/4/09	452	44	702	71	51	31	255	56%
	SK-12	6/6/09	197	19	518	32	35	13		
		6/9/10	43	7	147	29	13	8		
	SK-21	5/2/09	61	31	66	18	12	12	52	85%
		6/6/09	9	3	16	6	1	1		
	SK-31	6/5/09	81	25	377	161	31	25		
		6/10/10	31	12	411	213	48	45		
	SK-41	6/10/10	18	5	45	<20	3	1		
	SK-51	6/9/10	52	12	323	na	25	11		
North Fork Koktuli	NK-01	5/2/09	140	41	253	76	20	16	101	72%
		6/6/09	39	13	150	62	9	6		
		6/10/10	31	13	169	92	10	7		
	NK-02	6/7/10	30	10	241	na	14	6		
	NK-11	5/3/09	36	13	207	125	44	40	43	119%
		6/4/09	79	8	212	51	13	9		
		6/7/10	9	3	56	na	9	10		
	NK-21	5/3/09	60	33	175	89	11	7	23	38%
		6/6/09	37	25	102	51	5	3		
	NK-31	6/6/09	43	17	596	317	24	13		
Upper and Lower Talarik	UT-01	5/3/09	105	17	376	85	32	15	52	49%
		6/5/09	33	8	88	32	5	2		
		6/10/10	17	4	81	36	5	2		
	UT-02	5/2/09	330	28	646	122	30	12	28	92%
		6/5/09	74	14	217	65	11	6		
		6/8/10	28	8	157	67	13	10		
	UT-03	6/10/10	49	10	288	116	24	20		
	UT-11	5/1/09	92	23	263	56	20	8	31	34%
		6/5/09	61	17	139	31	10	2		
		6/10/10	26	10	100	36	5	2		
	UT-12	6/8/10	63	7	168	42	17	12		
	UT-21	6/8/09	67	14	103	34	6	4		
	UT-31	6/8/09	21	12	27	12	1	0.4		
	UT-41	6/9/10	29	9	40	<20	4	1		
	LT-11	5/2/09	35	12	126	60	37	35	32	92%
		6/7/09	67	12	99	26	4	1		

Watershed	Site	Date	Aluminum (ug/L)		Iron (ug/L)		Manganese (ug/L)		Difference in total aluminum May v June 2009	
			Total	Dissolved	Total	Dissolved	Total	Dissolved	absolute (ug/L)	%
North of mine lease	NW-11	5/1/09	297	22	700	137	31	20	257	86%
		6/8/09	42	10	187	86	12	10		
		6/9/10	38	9	189	83	13	11		
	CH-11	5/3/09	1027	18	1510	222	103	67	958	93%
		6/5/09	70	14	334	158	33	26		
		6/7/10	147	11	530	na	61	51		
	GH-01	6/3/09	47	21	209	85	9	3		
	RC-01	6/8/09	66	9	259	76	15	11		
South of mine lease	KC-01	5/2/09	972	55	1070	199	38	28	886	91%
		6/7/09	86	22	515	222	17	15		
		6/9/10	51	16	438	221	15	13		
	KC-11	6/9/09	218	32	456	161	12	7		
	SY-01	6/7/09	38	24	103	61	3	2		
	SY-02	6/9/10	136	16	601	256	18	17		
	SY-11	5/2/09	141	77	44	16	29	31	20	14%
		6/7/09	121	119	26	26	4	4		



Watershed	Site	Date	Cadmium (ug/L)		Copper (ug/L)		Lead (ug/L)		Zinc (ug/L)	
			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
South of mine lease	KC-01	5/2/09	0.013	0.003	0.8	0.18	0.43	0.04	5.12	6.04
		6/7/09	0.003	0.003	0.22	0.10	0.04	0.02	1.05	0.70
		6/9/10	<0.02	<0.02	0.2	0.1	0.03	0.01	0.6	0.3
	KC-11	6/9/09	0.003	0.003	0.34	0.13	0.08	0.02	1.10	0.60
	SY-01	6/7/09	0.016	0.014	0.09	0.07	0.02	0.01	0.90	1.30
	SY-02	6/9/10	<0.02	<0.02	0.20	0.10	0.09	0.01	0.8	0.6
	SY-11	5/2/09	0.011	0.004	0.22	0.21	0.14	0.08	9.44	4.87
North of mine lease	NW-11	5/1/09	0.008	0.003	0.54	0.17	0.34	0.04	3.32	3.05
		6/8/09	0.003	0.003	0.20	0.14	0.05	0.01	2.30	1.40
		6/9/10	<0.02	<0.02	0.20	0.20	0.03	0.01	0.4	0.4
	CH-11	5/3/09	0.012	0.003	1.35	0.23	0.60	0.0025	6.29	3.25
		6/5/09	0.003	0.003	0.35	0.27	0.05	0.01	1.48	1.80
		6/7/10	<0.02	<0.02	0.6	0.3	0.13	0.01	1.5	0.25
	GH-01	6/3/09	0.016	0.009	0.20	0.14	0.03	0.01	1.00	0.80
	RC-01	6/8/09	0.014	0.010	0.50	0.30	0.27	0.02	7.20	2.20